Domain walls and interfaces in antiferromagnets

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Domains walls play an important role in our current understanding of exchange bias, the unidirectional pinning of a ferromagnet, which is in contact with an antiferromagnet. I will give an overview over recent experiments using x-ray spectroscopy and microscopy, which demonstrate the presence of antiferromagnetic walls and illucidate their function.

For example, a wall parallel to the ferromagnet/antiferromagnet interface is formed when the magnetization of the ferromagnet is rotated, leading to a twisted spin structure, similar to the one found in ferromagnetic spring magnets. Direct evidence of such an antiferromagnetic exchange spring in single cystal, epitaxial, and polycrystalline Co/NiO/xxx samples will presented. Analysis of the wall rotation process provides quantitative data of the sample-specific interface coupling and antiferromagnetic wall energy.

I will also discuss the role of vertical walls and of uncompensated interface spins, which mediate the coupling at the interface. The analysis of the local bias field in Co/LaFeO3 shows an increase of the bias field with decreasing domain size as expected assuming a statistical distribution of pinned spins. X-ray spectroscopy shows that the macroscopic bias field is related to the fraction of uncompensated spins that are pinned.